Magnetic tunnel junctions as a storage element for memory device

Ia. M. Lytvynenko – *Sumy State University*

Spin-dependent tunneling in magnetic tunnel junctions (MTJs) has recently aroused great research interest and has developed into a separate branch of materials science. The large tunneling magnetoresistance (TMR) observed in MTJs got much attention due to possible applications in non-volatile random access memories and next generation sensors of magnetic field. This affected a number of fundamental issues concerning the phenomenon of spin-dependent tunneling. MTJs consist of two ferromagnetic metal layers separated by a thin insulating barrier layer, which must be so thin (no more than a few nms) that electrons can tunnel through the barrier when bias voltage is applied to metal electrodes across the insulator. As a rule MTJs electrodes use both soft and hard magnetic layers made of materials with different coercivity whereas the insulating layer uses an amorphous Al_2O_3 or crystalline MgO. Nowadays MTJs that are based on 3d-metal ferromagnets and Al_2O_3 barriers can be routinely fabricated with reproducible characteristics, this making them suitable for industrial applications. However, research of MTJs remains a relevant scientific task. The main property of a MTJ is tunneling current dependance on the relative orientation of ferromagnetic layers magnetization, changing under the applied magnetic field (that of TMR). One of the most important problems in MTJs research is the creation of stable structures with effective perpendicular magnetic anisotropy (PMA).

In this work the experimental results of studying epitaxial single-crystal magnetic tunnel junctions based on a V/Fe soft layer (the thickness is only 5-7 monoatomic layers) and a Fe/Co hard layer are represented. The soft magnetic layer is integrated as a free layer in the MTJs for determining its magnetic response to various electric fields through the MgO barrier. Astrong PMA is observed on the thin Fe layers on applying a positive bias voltage to the MTJ electrodes, and the anisotropy constant decreases with the increase of bias voltage.

G. I. Lytvynenko – *E L Adviser*

Соціально-гуманітарні аспекти розвитку сучасного суспільства : матеріали Всеукраїнської наукової конференції викладачів, аспірантів, співробітників та студентів, м. Суми, 21-22 квітня 2014 р. / Відп. за вип. О.М. Сушкова. — Суми : СумДУ, 2014. — С. 424.